

# Financial equilibrium: An in-depth look at working capital management and productivity in manufacturing SMEs in Ecuador

Edison Roberto Valencia-Nuñez<sup>1\*</sup>, Erika Belén Velastegui Villacis<sup>2</sup>, Jorge Enrique Jordán Vaca<sup>3</sup>, Jorge Francisco Abril Flores<sup>4</sup>

<sup>1,2,3,4</sup> Technical University of Ambato, Ecuador

\*Corresponding author E-mail: [edisonvalencia@uta.edu.ec](mailto:edisonvalencia@uta.edu.ec)

Received Apr. 1, 2024

Revised Jun. 27, 2024

Accepted Jul. 3, 2024

## Abstract

The manufacturing industry is one of the main axes of the economy, which has been affected by the global economic crisis, so the competent authorities must address this problem by efficiently using the administration and management of resources. This research aimed to analyze working capital as a function of productivity in manufacturing SMEs in Zone 3 of Ecuador, one of the most important sectors worldwide. It has a quantitative approach, through the statements of financial situation presented in the SUPERCIAS of 112 SMEs in the years 2017 to 2020 that have remained constant over time, to carry out this process, data obtained from secondary sources were recorded by means of an observation sheet. Descriptive statistics, Spearman's Rho correlation, multivariate statistics, and principal component analysis, were used to perform a multiple linear regression model to detect the best year for predictions. The results showed that both small and medium-sized companies presented positive values with respect to the average working capital and productivity. On the other hand, for the year 2020 the two variables were affected due to the pandemic in this sector reducing their values, working capital and productivity have an average positive correlation; it was also determined that the year 2018 is the best year for predictions, being that the variables studied are financial indicators that contribute to the decision making in the companies.

© The Author 2024.

Published by ARDA.

**Keywords:** Working capital, Productivity, Manufacturing, SMEs, Resource efficiency

## 1. Introduction

The manufacturing industry is one of the main axes of the economy, it has been affected by the global economic crisis, which has had serious repercussions, so it is necessary that the competent authorities address this problem by efficiently using the administration and management of resources [1].

As expressed by ECLAC (2017) in Latin American countries, the manufacturing industry represents on average 14.3% of GDP, thus being the fourth sector with the largest share of the economy. In terms of foreign direct investment, net flows in millions of dollars were USD 82.6 in the fourth quarter of 2017,

This work is licensed under a [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/) (<https://creativecommons.org/licenses/by/4.0/>) that allows others to share and adapt the material for any purpose (even commercially), in any medium with an acknowledgement of the work's authorship and initial publication in this journal.



these were concentrated in agriculture, forestry, hunting, and fishing with USD 26.5 and the manufacturing sector with USD 25.1 [2].

In Ecuador, small and medium-sized companies are constituted according to the number of workers, sales, years in the market, production level, assets, and liabilities. They represent 80% of companies in the world economy, this percentage varies every year, so it is evident that it is a very important sector for the creation of jobs, productive growth, and economic sustainability [3].

In 2019, the province of Tungurahua belonging to Zone 3 of Ecuador, accounted for 5.37 % of manufacturing sales, while agriculture, livestock, forestry, and fishing accounted for 4.5 %, which provides evidence that demand in the sector is below 10% unlike other sectors [4]. To survive in the current market, small and medium-sized companies are looking for ways to invest, but it should be emphasized that for now, companies must leave aside the same systems they have used for years in order to update their knowledge in search of new development techniques.

### **1.1. Theoretical model**

The manufacturing industries sector is in literal C within the schematic distribution of the ISIC (International Standard Industrial Classification) revision 4.0. The sector's GDP (Gross Domestic Product) recorded a lower rate of decrease than the total in 2020 and by 2022, according to the estimate of the ECB (Central Bank of Ecuador), this sector will grow at slightly lower levels, 2.4% below the growth rate of the economy as a whole, 2.8% [5].

Morales [6] mentions that working capital deals with the management of current assets as well as current liabilities, a minimum contribution that is necessary for all companies to carry out their activities without any restriction. With respect to productivity, it provides [7] that it is related to production efficiency in the manufacturing sector, which is one of the definitive elements of competitiveness and is therefore considered a main source of economic growth and an increase in the average standard of living of a country.

This scheme mentions that optimal working capital management is essential to improve productivity since it allows the company to maintain an adequate level of resources to finance its operations and at the same time minimize financing costs. In summary, net working capital and productivity are closely related, and a company must seek an appropriate balance between the two to achieve its maximum potential.

#### **1.1.1. Finance**

Finance is the most important management tool to potentially increase production with higher commercial value, greater efficiency, and profitability. It is in charge of the proper functioning of money and financial resources in the right way to achieve the objectives set by the company [8].

#### **1.1.2. Financial management**

For [9] financial management within a company contributes significantly using applied techniques that can facilitate the proper management of the various resources it has, resulting in the increase of the same, benefiting workers, directors, and investors. On the positive side, it also facilitates the use and interpretation of information about the financial flows that show the situation of the company, which allows for making correct decisions for the development of the entity, generating productive management applied to any field.

As announced by [10] financial management is the art of managing money, it is responsible for the planning, organization, and control of the financial resources of a company; within this, there are several responsibilities in making management decisions on investment, savings, and financing of the different areas. Therefore, financial management is of vital importance for any organization, since it allows an adequate control and distribution of monetary resources according to previously established goals.

**1.1.3. Financial indicators**

They are a way of understanding important events of the operations carried out of the economic situation of a company, measuring its development over time with respect to others within an industry. It also allows us to evaluate and understand its capacity to perform and fulfill functions to generate income.

When the company can assume and pay its debts, it can be said that it has a good performance in the market, thus it will be able to obtain credits, investments, and income growth so that it does not affect its profitability. Financial indicators are identified as solvency, liquidity, operating efficiency, and profitability indicators. Also, the Superintendency of Securities and Insurance classifies them according to liquidity, solvency, management, and profitability indicators [11].

**1.1.4. Liquidity indicator**

Within a company, liquidity is the money that is available for the payment of debts, mainly in the short term. Research by [12] mentions that it is essential for the company to generate it efficiently so as not to generate problems in its obligations or generate operational changes. Therefore, it shows the company's indebtedness capacity and whether it has sufficient financial capacity to assume it.

**1.1.5. Working capital**

As announced by [13] working capital is the amount of money a company needs to be able to operate normally during a production cycle while recovering the sales made. He also mentions that this indicator measures solvency because it reflects the company's ability to meet short-term debts, i.e., it is the funds needed by the company to continue normally operating its activities.

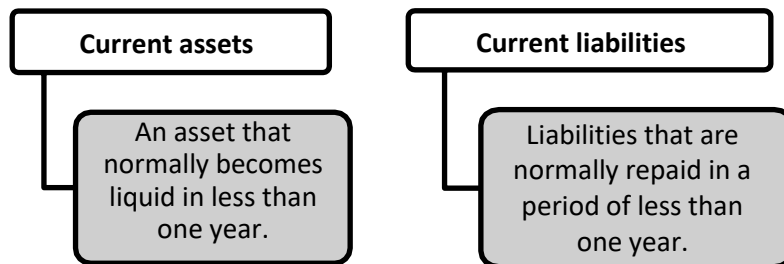


Figure 1. Accounts for working capital calculation

**1.1.6. Working capital management**

According to [14] it is one of the most important activities in all fields of financial management, requiring considerable attention and time to manage it properly to maximize the value of the company. At the same time, the company must add additional funds to invest in accounts receivable, inventory, and fixed assets. A proper analysis and review by management is required to prove good or bad working capital management.

This scheme [13] mentions that working capital management is the decision to be made regarding cash flows in the short term. As well as, managing a correct administration and financing of investments in current assets. Based on the above, current assets and liabilities are made up of the following accounts:

Current assets	Cash Banks Customers Inventories Advances to suppliers
Current liabilities	Suppliers Notes payable Accounts payable Taxes and duties payable

Figure 2. Working capital management

### **1.1.7. Gross working capital**

Working capital is also known as current, turnover, or working capital, and is the measure of a company's capacity for its short-term development. It is considered the sum of current assets represented by cash and banks, marketable securities, accounts receivable, and inventories. It is calculated as the surplus of assets over short-term liabilities; a company's assets can be converted into cash such as land or buildings and equipment, and accounts receivable that become effective within one year can also be added [15].

### **1.1.8. Net working capital**

As announced by [13] working capital is the amount of money a company needs to be able to operate normally during a production cycle while recovering the sales made. He also mentions that this indicator measures solvency because it reflects the company's ability to meet short-term debts, i.e., it is the funds needed by the company to continue normally operating its activities.

On the other hand, there is some confusion between the meaning of working capital and net working capital, which is why [16] states that working capital is all the company's current assets. That is all the accounts that the company expects to convert into cash in a period of less than one year, involving cash, accounts receivable, and inventories.

### **1.1.9. Productivity**

Mankiw [17] mentions that productivity measures and calculates the total amount of goods and services produced by each factor such as labor, capital, and time, among others. In other words, productivity allows us to know what a worker produces in each period.

For [18] economists use the term productivity to refer to the output within an industry and the inputs that are used to produce the good or service at lower costs. In other words, the more goods, or services the entity produces, the more productive it is.

Currently, talking about productivity is not only the economic development of companies but also the economic development of society and the country since productivity is related to business and social economic development. Productivity is related to the improvement of processes through the relationship between the resources used and the goods and services produced.

#### **1.1.9.1. Expressions of productivity**

- **Partial productivity**

For [19] partial productivity is related to everything originated by a system with one of the input resources. For example, labor productivity is the ratio between a certain total amount of goods and services produced and labor employed.

- **Total productivity**

Total productivity includes all inputs used by the system, i.e. the ratio of output to the sum of inputs [19].

- **Valorized productivity**

Valorized productivity is the same as physical productivity, but output is valorized in monetary terms.

- **Average productivity and marginal productivity**

Average productivity is the ratio between the total output of the system and the number of inputs used, thus facilitating the comparative analysis of the productivity of different systems and recording the improvement or deterioration of the index over time. The marginal productivity of labor is the increase in production achieved by employing one more unit of labor while keeping the other factors unchanged [19].

- **Gross productivity and net productivity**

Gross productivity is the ratio between the gross value of output and input including input values, thus making it easier to measure the index. On the other hand, net productivity also known as value added, is an output for an input where the value of some inputs is excluded from the numerator and denominator of the index [19].

### **1.1.9.2. Productivity and performance indicators**

- **Market share index**

According to [20] market share is an index used by companies to know their performance with respect to their competitors. It is the percentage share that a specific product has concerning similar products of other companies in the same business sector, it shows the preference of consumers for a product compared to other similar products.

In general, the higher the market share, the higher the sales volume and the less effort the company must make to sell. In addition, the entry barrier for new competitors will be strong; when a company has a large market share and is the leader in its sector, in the event of a possible expansion of the market, it will also gain more than its competitors.

### **1.1.10. Dupont index**

Referring to [21] the Dupont index is a set of financial, economic, and operating results of a company, based on accounting information standards. This index stands out because it shows the productivity indicators of the company according to a simple formula, allows analytical decisions to be made, and knows the percentage of the entity's profit.

The technique described is a financial analysis that considers the net profit margin, sales, fixed assets, total assets, and equity. These data are responsible for the growth of the company, since, if good sales figures are achieved, it is possible to effectively use its assets, optimize resources and costs, and achieve an efficient profit, which means the growth of this index [21].

Returning to the words of [21] the main advantage of the Dupont index is its simplicity, which means that financial data is usefully reduced to a single indicator that is easy to measure and compare. It is perfect for analyzing or simulating the impact of certain business activities. Due to the clarity of the results provided, it can be easily linked to staff compensation systems that include the achievement of certain company financial goals. One of the drawbacks for the Dupont index to be reliable is the availability of reliable and up-to-date accounting data. This index warns when there are problems but does not provide insight into actions that need to be taken or changed, so it must be used in conjunction with other company control systems that provide detailed information.

### **1.1.11. Ecuador's manufacturing sector**

The United Nations System of National Accounts defines the manufacturing sector as the mechanical or chemical transformation of organic and inorganic substances into new products. The status of manufacturing has been transformed over the years, as it manages to position itself at the forefront of the globalized environment and position itself as one of the most sustainable industries, this promises constant supply and purchase [22].

## **2. Research method**

### **2.1. Population**

According to [23], these are different ways of referring to a set of elements that make up the area of analytical interest and on which we wish to infer conclusions from the analysis, whether statistically, substantively, or theoretically. On the one hand, we speak of a finite universe, which refers to the precise

set of units from which the sample is drawn for the analysis. On the other hand, the target population is mentioned, which refers to the population set to which the results obtained can be generalized; indeed, in this study, it was constituted by 112 companies belonging to Zone 3 of the manufacturing sector of Ecuador in an active state that is constant over time in the period 2017-2020.

## 2.2. Sources of data

Secondary sources were used exclusively, as [24] points out, which offer information on the research topic, although they are not the original source of the facts, but quote them and provide some examples, such as books, magazines, written and documentary documents, among others. The data used for the study were obtained through the Superintendence of Companies, Securities, and Insurance, specifically in the information portal, corporate sector. In the company search section, it shows the financial statements needed to calculate the indicators for each variable using data from Form 101. This statistical base covers the period from 2017 to 2020. The study focuses on analyzing the financial behavior, particularly in terms of working capital and productivity of manufacturing companies' constant over time that are registered and controlled by SUPERCIAS.

## 2.3. Method

The scientific method was used in the collection of information, which [24] describes as a set of principles, norms, rules, and procedures used to address research problems and employ the necessary instruments or techniques. On the other hand, [25] argues that the scientific method refers to the path followed to carry out an investigation, using a series of procedures that allow one to deepen knowledge and demonstrate it rigorously, including collecting, analyzing, and presenting information. The hypothetico-deductive method was also used, this method starts from a general statement or based on previous studies, generating hypotheses or predictions that are then contrasted or tested by means of conclusions for their acceptance or rejection.

## 2.4. Techniques

In the words of [26], techniques refer to the different ways in which information can be obtained. They are skills and abilities used in the different stages of the research, thus guiding the construction of knowledge. In this case, a documentary analysis was carried out to subsequently record data in the secondary data sheet. We proceeded to record the data and subsequently perform the respective analysis, as indicated by [27] to carry out this process, data obtained from secondary sources were recorded and matrices were used as instruments for data collection of the relevant variables. These matrices included columns for the calculation of working capital and productivity applied to each entity and period analyzed.

## 2.5. Instruments

An observation sheet was made of the companies that have remained constant over time from the Superintendency of Companies, Securities, and Insurance and thus generated the calculation of working capital and productivity using data from their respective accounting accounts in the period 2017-2020.

For the calculation of the indicators, data were taken from the statement of financial position for each year, based on the following formulas:

$$\text{Working Capital} = \text{current assets} - \text{current liabilities}$$

$$\text{DUPONT Index} = \left( \frac{\text{Net Income}}{\text{Sales}} \right) * \left( \frac{\text{Sales}}{\text{Fixed assets}} \right) * \left( \frac{\text{Total assets}}{\text{Equity}} \right)$$

In this research, descriptive statistics were carried out, using measures of central tendency such as the arithmetic mean, mean, and median. In addition, measures of dispersion such as standard deviation, variance, and coefficient of variation were used.

In the second phase of the study, Spearman's rho coefficient was used to evaluate the degree of adjustment and the association between the variables, through its application it is possible to determine the dependence or independence between working capital and productivity as a function of the years of study.

Table 1. Interpretation of Spearman's rho coefficient

Coefficient	Relation
-0.91 a -1.00	Perfect negative correlation
-0.76 a -0.90	Very strong negative correlation
-0.51 a -0.75	Significant negative correlation
-0.11 a -0.50	Average negative correlation
-0.01 a -0.10	Very weak negative correlation
0.00	There is no correlation between the variables
+0.01 a +0.10	Weak positive correlation
+0.11 a +0.50	Average positive correlation
+0.51 a +0.75	Significant positive correlation
+0.76 a +0.90	A very strong positive correlation
+0.91 a +1.00	Perfect positive correlation

Subsequently, multivariate statistics were applied to principal component analysis (PCA), which is a technique that allows the joint processing of observed variables, thus reducing the amount of data, and attempts to identify a set of dummy variables created from combinations of the initial variables [24].

To carry out the proposed analysis, the results of the KMO (Kaiser-Meyer-Olkin) test of sampling adequacy and Bartlett's sphericity are considered; this test summarizes the fulfillment of the basic assumptions and allows us to determine whether the analysis is feasible to continue with the process.

We rely on the premise:

$$0,9 \leq KMO \leq 1,0 = \text{Excellent sample adequacy}$$

$$0,8 \leq KMO \leq 0,9 = \text{Good sampling adequacy}$$

$$0,7 \leq KMO \leq 0,8 = \text{Acceptable sampling adequacy}$$

$$0,6 \leq KMO \leq 0,7 = \text{Fair sample adequacy}$$

$$0,5 \leq KMO \leq 0,6 = \text{Poor sample adequacy}$$

$$0,0 \leq KMO \leq 0,5 = \text{Unacceptable sampling adequacy}$$

Finally, as explanatory research, an econometric projection model was applied. The objective of a multiple linear regression model is to try to explain the relationship that exists between a dependent variable "Y" and a set of independent variables, the equation of this econometric model is as follows:

$$y = b_0 + b_1X_1 + b_2X_2 + \dots + b_kX_k + u \quad (1)$$

To know if the variables are related, regression tests must be considered:

- If the null hypothesis is accepted, it means that there is no linear relationship between the variables and the model and the model is inappropriate.
- If the null hypothesis is rejected, this means that the linear model is appropriate.

The processing of the information in SPSS version 26 software allowed for more in-depth analysis and investigation of the factors, thus fulfilling the objectives set.

### 3. Results and discussion

#### 3.1. Results

In the first instance, small companies obtained 53.6% participation of 60 companies within the companies of the manufacturing industry in zone 3 of Ecuador, while 46.4% corresponds to 52 medium-sized companies that have remained constant over time in the years 2017-2020. The business structure of this research is distributed in different sectors of Ecuador since as companies become smaller, their number of participation in the economy increases.

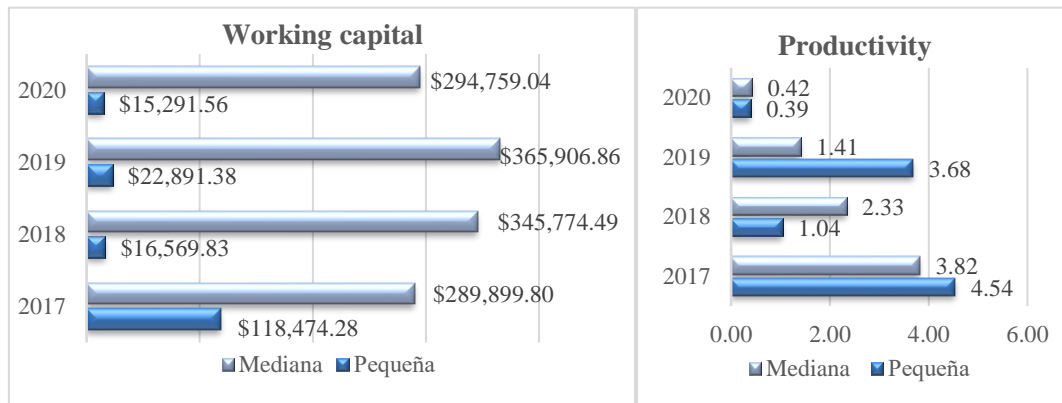


Figure 3. Average working capital and productivity by type of SME

It was reflected that for small and medium-sized companies from 2019 to 2020, there was a significant decrease in the variables due to the worldwide pandemic which significantly affected small and medium-sized companies in said variable which is fundamental to face their short-term debts.

To achieve the second objective, when the results are generated with the values obtained from Spearman's Rho coefficient, we will be able to define how and to what extent productivity affects working capital in manufacturing SMEs.

Table 2. Correlation of working capital and productivity using Spearman's rho

Year	Relation	Spearman's rho	Analysis
2017	Working capital and productivity	Correlation coefficient	,195*
		Sig. (bilateral)	0,04
		N	112
2018	Working capital and productivity	Correlation coefficient	0,143
		Sig. (bilateral)	0,13
		N	112
2019	Working capital and productivity	Correlation coefficient	0,184
		Sig. (bilateral)	0,05
		N	112
2020	Working capital and productivity	Correlation coefficient	0,062
		Sig. (bilateral)	0,51
		N	112

Table 2 shows that all years have a positive correlation, therefore the null hypothesis is rejected and the alternative hypothesis is accepted. Subsequently, multivariate statistics were used through a principal component analysis (PCA) to reduce the size of the set of original variables and then perform a multiple linear regression model with the principal components obtained.

The results are obtained from SPSS:



Table 3. Kaiser-Meyer-Olkin and Bartlett test in 2018

Kaiser-Meyer-Olkin measure of sampling adequacy		0,615
Bartlett's test for sphericity	Approx. chi-square	1078,157
	gl	21
	Sig.	0,000

Bartlett's test of sphericity gives a sig. of 0.000, which is less than 0.05, so the null hypothesis is rejected and the alternative hypothesis is accepted.

Table 4. Communalities year 2018

	Initial	Extraction
Net income	1,000	0,240
Total assets	1,000	0,984
Heritage	1,000	0,340
Current assets	1,000	0,731
Current liabilities	1,000	0,579
Sales	1,000	0,955
Fixed assets	1,000	0,828

Table 4 of commonalities expresses the commonality between the group of variables. In this case, the variable "Total assets" shows that its correlations are 98.4% explained by the factorial model obtained, "Sales" explains 95.5%, and "Fixed assets" 82.8%. The commonalities are very high when they are closer to 1, which affirms that the variables are very well explained. To identify this relationship more precisely, a varimax rotation was performed in order to follow the simple structure principle:

Table 5. Matrix of rotated component year 2018

	Component 1	Component 2
Net income		0,427
Total assets	0,827	0,548
Heritage	0,560	
Current assets	0,451	0,726
Current liabilities	0,621	0,440
Sales		0,968
Fixed assets	0,891	

With these results obtained, the components were denominated Component 1: Financial structure and Component 2: Yield and liquidity.

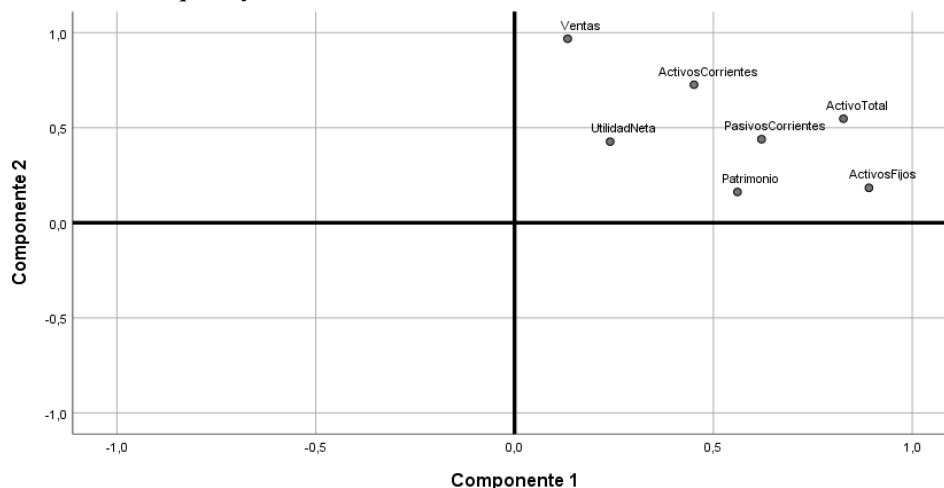


Figure 4. Component plot in rotated space year 2018

Finally, to fulfill the third objective of this research, a multiple linear regression model was performed with the result of the PCA principal component analysis.

Table 6. Summary of the multiple linear regression model year 2018.

Model	R	R square	Adjusted R-squared	Standard error of the estimate	Durbin-Watson
1	,977a	0,955	0,954	247680,43000	1,820

As shown in Table 6, in 2018 an  $R^2$  of 0.955 is obtained, which means that 95.5% of the variance of the dependent variable is explained in the model. With respect to the Durbin-Watson statistic of the output offered by SPSS of the research, it aims to verify the independence of the errors, since 1.820 is within the values of 1.5 and 2.5 as established.

The summary ANOVA statistic in 2018, had a significance of  $0.00 > 0.005$  which allowed us to assess the existence of a significant linear relationship between the dependent variable and the independent variables of the model.

Table 7. Coefficients of the multiple linear regression model year 2018

Model	Coefficients not standardized		Standardized coefficients	t	Sig.
	B	Error	Beta		
1	Constant	1410216,942	23403,601	60,256	0,000
	Financial structure	154102,947	23508,786	0,133	6,555
2	Yield and liquidity	1119114,126	23508,786	0,968	47,604

The summary ANOVA statistic in 2018, had a significance of  $0.00 > 0.005$  which allowed us to assess the existence of a significant linear relationship between the dependent and independent variables of the model.

Model equation:

$$y = b_0 + b_1X_1 + b_2X_2 + \dots + b_kX_k + u \quad (2)$$

$$Ventas = 1410216,942 + 154102,947X_1 + 111914,126X_2 \quad (3)$$

Table 7 identifies the coefficients in the multiple linear regression study in 2018, so that, the non-standardized beta coefficients are in an ascending order which makes evident the order of importance by their weight in relation to the constant. The same happens with the p-value, i.e., the probability of an association between the variables. In this case, they have a significance of 0.000 which confirms what was said above.

Based on the above, the equation of the model in 2018 is observed that as long as there is greater financial structure, performance, and liquidity, sales increase by \$1'410,216.942 million.

### 3.2. Discussion

This research reveals a strong positive correlation between effective working capital management and the efficiency of manufacturing SMEs. Recent research [29] in the European context validates this association and indicates that firms that improve their working capital through competent management of inventories, accounts receivable and accounts payable can significantly improve their financial and operating performance. As in Ecuador, European SMEs that manage their working capital effectively tend to show superior productivity indicators, underscoring the universal importance of these financial strategies.

Similarly, a recent review [30] in India also reinforces the findings of the Ecuadorian article. Exploring Indian manufacturing SMEs, they observed that decreasing the cash conversion cycle and strategic control of working capital components translate into increased profitability and operational efficiency. As in the case of SMEs in Ecuador, these strategies allow companies to free up resources that can be reinvested in productive activities, thus improving their competitiveness in the industry. This similarity in results underscores the importance of working capital management in diverse economic and cultural environments.

In addition, a study conducted [28] in China on manufacturing SMEs highlights that optimal working capital management is vital for maintaining financial equilibrium and improving productivity. Their results propose that effective inventory management and reduction of accounts receivable periods are crucial elements for favorable financial performance. These findings are consistent with those found in Ecuador and illustrate that, regardless of geographic and market distinctions, efficient working capital management techniques exert a significant influence on SME productivity. Taken together, this recent research validates the findings of the Ecuadorian article and underscores the importance of proactive working capital management in advancing overall business performance.

#### **4. Conclusions**

Through the values obtained from the average of working capital, it was observed that the medium-sized manufacturing companies are those that have greater liquidity due to their size. However, the small companies also demonstrated to have control in this variable; they had current assets that exceeded current liabilities or short-term debts during the four years of study, which greatly benefits the growth of the companies since an effective control is achieved in the activities of the sector allowing in development in its economic activity.

Small and medium-sized companies from 2019 to 2020, presented a significant decrease in both working capital and productivity due to the global pandemic, which significantly affected these variables, which are essential to meet their short-term debts, which were determined by means of measures of central tendency.

By collecting information on the manufacturing SMEs of Ecuador through the financial statements, it was shown an average positive correlation between working capital and productivity in the year 2017 to 2019, a result that evidences that there is a regular association between these variables. This means that when one variable increases the other grows at the same time, but not quickly. For the year 2020, a weak positive correlation is presented, i.e. there is a low association between the variables, they grow at the same time, but very slowly. However, they could improve their situation for companies to be more productive.

Multivariate statistics were applied using principal component analysis (PCA) to reduce the size of the original set of variables, resulting in two principal components for each year of study. Based on this, a multiple linear regression model was performed, in which for 2018 the model explains 95.5% of the variance, it was established that, as the “financial structure” and “performance and liquidity” grow, the sales of SMEs increase 1'410,216.942 million dollars, this being the best year for future predictions. Based on this research, other interesting research topics could be continued, extending them with more years of study to verify the behavior of these variables and compare them with other financial indicators.

#### **Declaration of competing interest**

The authors declare that they have no conflict of interest, and all the authors agree to publish this paper under academic ethics.

#### **Funding information**

This article is derived from the research project "Financial sustainability model for working capital management in manufacturing SMEs in Zone 3", approved through Resolution No. UTA-CONIN-2023-0132-R, and financed

with funds from the Directorate of Research and Development (DIDE) of the Technical University of Ambato, Ecuador.

### Author contribution

The contribution to the paper is as follows: Roberto Valencia-Nuñez: data analysis and information processing; Erika Velastegui-Villacis: introduction and methodology; Jorge Jordan-Vaca: background of the research and its importance; Jorge Abril-Flores: results and conclusions. All authors approved the final version of the manuscript.

### References

- [1] ONUDI, “Informe sobre el desarrollo industrial 2022 - resumen,” 2022.
- [2] Banco Central del Ecuador, “Ecuador creció 3.0% en 2017 y confirma el dinamismo de su economía.”
- [3] L. Horna, M. Guachamín, and N. Osorio, “Análisis de mercado del sector industrias manufactureras en base a CIUU 3 bajo un enfoque de concentración económica en el período 2000-2008 en el Ecuador,” *Rev. Politécnica*, vol. 30, no. 1, pp. 230–243, 2009.
- [4] A. Sánchez, T. Vayas, F. Mayorga, and C. Freire, “El desarrollo empresarial y sectorial en el Ecuador,” *Obs. Económico y Soc. Tungurahua*, pp. 1–10, 2020.
- [5] V. y S. Superintendencia de Compañías, “Sistema de banca privada y pública informe del sector industrias manufactureras,” 2022.
- [6] J. Morales, “El capital de trabajo de las empresas de la industria de la transformación de la bolsa Mexicana de valores ante la crisis 2008-2010,” pp. 5–16, 2011.
- [7] R. Martínez, “Relación entre la calidad y productividad en las pymes del sector servicios,” *Publicaciones en Ciencias y Tecnol.*, vol. 7, no. 1, pp. 85–102, 2013.
- [8] O. Navarro, M. Crespo, and M. López, “Perspectivas de la administración financiera del capital de trabajo como instrumento necesario en la evolución de las Mipymes,” *Espacios*, vol. 39, no. 42, pp. 1–14, 2018.
- [9] C. Acosta, M. Terán, Á. Álvarez, and E. Salazar, *Gestión financiera*. 2018.
- [10] J. C. Van Horne and J. M. Wachowicz, *Fundamentos de la administración financiera*. 2010.
- [11] R. Flores Villalpando, *Análisis de los estados financieros*. 2014.
- [12] M. Bravo, *Contabilidad general*. 2002.
- [13] O. Ponce, M. Morejón, G. Salazar, and E. Baque, *Introducción a las finanzas*. 2019.
- [14] J. Berk and P. DeMarzo, *Finanzas corporativas*. Pearson, 2008.
- [15] L. Gitman and C. Zutter, *Principios de administración financiera*. 2012.
- [16] F. Allen, R. A. Brealey, and S. C. Myers, “Principios de finanzas corporativas,” *McGrawHill*, pp. 1–1066, 2010.
- [17] G. Mankiw, *Principios de economía*. 2012.
- [18] A. Smith, *La riqueza de las naciones*. 1776.
- [19] R. Carro and D. González, “Productividad y competitividad,” *Adm. las operaciones*, 2012.
- [20] A. Benavides, C. Rivera, F. Videá, and Y. Ramírez, “Análisis de la participación de mercado de variedades Aura en redes sociales en la ciudad de Estelí en el segundo semestre del año 2019,” 2019.
- [21] L. Hidalgo del río and L. Sauñe Tapia, “Año de la lucha contra la corrupción e impunidad,” 2019.
- [22] Á. Fugiel, D. Burchart, K. Czaplicka, and A. Smoliński, “Categorías de impacto y daño ambiental causados por las emisiones contaminantes del aire de los sectores de minería y canteras de los países europeos,” vol. 143, pp. 159–168, 2017.

- [23] P. López and S. Fachelli, "Metodología de la investigación social cuantitativa," 2015.
- [24] C. A. Bernal Torres, *Metodología de la investigación*. 2010.
- [25] R. Rojas Soriano, *Guía para realizar investigaciones sociales*. 2013.
- [26] F. Arias, *El proyecto de investigación*, Sexta edic. 2018.
- [27] J. H. Pimienta Prieto and A. De la Orden Hoz, *Metodología de la investigación*, 2017.
- [28] Dong, L. X., & Dussel Peters, E. Oportunidades y retos económicos de China para México y Centroamérica, 2020.
- [29] N. Aktas., Croci, E., & Petmezas, D. Is Working Capital Management Value-Enhancing? Evidence from Firm Performance and Investments. *Journal of Corporate Finance*, 30, 98-113, 2019.
- [30] Singhanía, M. and Mehta, P. "Working capital management and firms' profitability: evidence from emerging Asian countries", *South Asian Journal of Business Studies*, Vol. 6 No. 1, pp. 80-97, 2017.

This page intentionally left blank.